PSet 5: **Superposition & standing waves**

SI Leader: Stephen Iota (siota001@ucr.edu)
Course: Physics 40B (Spring 2019), Prof. Barsukov
Date: May 15, 2019

0 Investigating the principle of superposition

Explain the principle of superposition. Now, construct two wave fronts traveling towards each other with a specified velocity for each. Draw the initial snapshot graph. Next, elapse the system for some time until the two wave fronts. Draw another snapshot graph at the new time, paying special attention to how the two waves interfere with each other.

1 Resonances in open-closed tubes

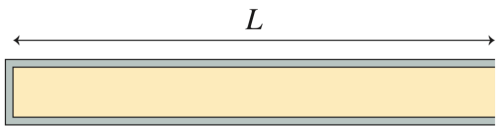

Figure 1: Open-closed tube of length L.

Let's think about what allowed modes of sounds waves are allowed in an open-closed tube such as in figure 1.

(a) Propose a general formula for the allowed wavelengths λ_n and frequencies f_n which generate standing waves in the open-closed tube.

(b) How do the boundary conditions for this system differ from the closed-closed system discussed in lecture?

2 Wave reflection

Consider a string with a large linear density is connected to one with a smaller linear density. A wave packet is traveling from the string with higher density to the string with lower density.

(a) What will the wave speed be once the wave packet crosses the discontinuity?

(b) Does part of the wave packet get reflected at the discontinuity? If so, what is the phase shift of the reflected wave?

(c) Draw the transmitted and reflected wave packets with appropriate phase shifts.

Now, consider the opposite scenario. A wave packet is traveling through a string with low linear density and reaches a string with large linear density. Repeat parts (a) – (c) for this case.